axis are marked by peculiar furrows,—characters not exhibited by the present species. The transverse furrow on the head-shield probably corresponds more or less in outline with the underlying hypostoma; but no traces of the latter organ, as already remarked, have yet been found.

In the preceding article on *Asaphus Canadensis*, it was stated that Professor Hall had published, in the first volume of the 'Palæontology of New York,' two imperfect caudal shields, under the name of *Asaphus* (?) *latimarginatus*. I would willingly adopt this specific name for our second Canadian form, because, so far as it is possible to determine, the two may prove eventually to be alike; but, on due consideration, I have thought it advisable to bestow upon the form in question a name altogether distinct. My object in this is solely to avoid the chance of confusion, in case the thorax and head-shield of Professor Hall's form should hereafter be discovered, and be found on examination, as would very likely happen, to constitute a different species. I therefore claim the privilege of naming the Trilobite described in this article,—a privilege to which I am justly entitled by the really indefinite character of the figures referred to above. The name I adopt as the most appropriate, under the circumstances of the case, is that of *Asaphus Halli*. Palæontologists, I am sure, will receive it willingly.

III.—*On the Structure of* Humphreyia, *an anomalous Bivalve Shell, hitherto confounded with* Aspergillum. By Dr. J. E. Gray, F.R.S., V.P.Z.S. &c.

In the preceding Number of this Journal, I gave an account of the development of the genus *Aspergillum*. Shortly after it was in print, Mr. Cuming kindly allowed me to examine the specimens of that genus in his extensive collections. I was delighted to find, mixed with the other species, a shell, which I was convinced, on a very cursory glance, could not be formed in the same manner as the *Aspergilla*, and, indeed, could have but very little relation to the other species of the genus to which it has been referred by Mr. Arthur Adams, who described and figured it in the 'Proceedings of the Zoological Society' for 1852 (p. 91. t. 15. f. 3), under the name of *Aspergillum Strangei*. It was received from Sydney Bay, Australia, by the late Mr. Strange.

This animal, instead of living in a tube sunk in the sand or mud of the sea-coast, like the *Aspergilla*, or in a tube more or less immersed in the substance of shells, rocks, or other marine bodies, like the *Gastrochænæ* and *Clavagellæ*, fixes itself by its ventral surface to shells or rocks, so that the whole of the shell, including its tubular prolongation, is exposed, giving it the appearance of a specimen of *Vermetus* or *Serpula*; and, like the *Vermeti*, the tube is covered with a distinct thin periostraca.

When the shell is more carefully examined, it is clear that it has been formed by a conchifer; for, like *Aspergillum*, the two valves of the young animal are to be seen forming a kind of umbo at the dorsal part of the base of the tubular projection.

But instead of the animal, as in *Aspergillum*, living free in the tube until it has attained its full size, and then fixing the shell in the substance of the tube itself, and closing its base, the animal of *Aspergillum Strangei* evidently attaches itself, shortly after it is hatched, by its ventral surface, to some fixed body; and then, as it requires room for its increased size, produces the hinder part of its shell into a projecting tube. For it is evident that the valves themselves are expanded below and on the sides, and are produced behind into the subquadrangular tube with a circular aperture; while, in the true *Aspergilla*, the valves are imbedded in the substance of the tube, and are to be seen, in all the species of the genus, of their full size, and with a well-defined edge on the inside of the tube; in some kinds only the umbones, and in others a larger part of the valves, being left exposed on the outer surface of the tube.

The valves of the newly-hatched free animal of *Aspergillum Strangei* are very soon united together, by shelly matter deposited on their inner surface, into a single shield-like shelly plate, which is extended on the sides; and the gap between the valves in front and below is filled up with a shelly deposit, which, with the united valves, forms a slipper-like bag attached by its ventral or lower side to the surface of some shell or rock; so that the shell has changed from a free, regular-shaped bivalve shell to a sessile, attached, slipper-like case. The shell is then gradually extended behind into a tube, as the animal requires a larger cavity for its protection, the periods of its enlargement being marked by transverse concentric impressed grooves.

The part of the tube in front of the valves is irregularly prominent, and scattered with shelly tubes, showing that the animal, like *Aspergillum*, is furnished with thread-like tentacles on the front of its mantle, which are emitted through these tubes; and there is also a series of holes, often placed in pairs, and sometimes produced into flat processes, on the edge of the ventral part of the tube, just above the part which is attached to marine bodies, doubtless for the protrusion of similar tentacles. The cavity of the shell is quite simple, without any indication of the shape of the two valves which are seen externally, or of the valves which are seen in the interior of the tube in *Aspergilla*.

This shell must form a distinct genus, which I have named *Humphreyia*, after George Humphrey, the shell-dealer and conchologist, who published the Catalogue of M. De Calonne's collection, in 1797; and I have no doubt it is the type of a new family, *Humphreyiadæ*.

The two specimens in Mr. Cuming's collection which are here figured (figs. 1 & 2), are very unlike; and this difference has assisted me in giving the above account of their structure and formation.

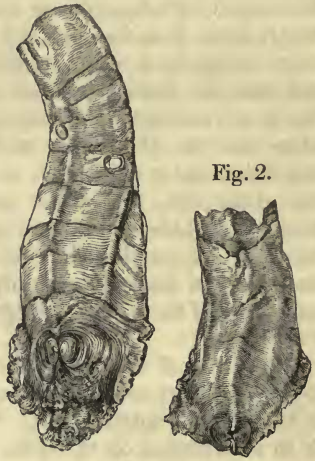
Fig. 1. Fig. 2.

Humphreyia Strangei.

In the larger one (fig. 1) the valves of the shell were considerably enlarged and well developed, approaching the form of ordinary bivalve shells, before the animal developed the slipper-like case by which they are attached, and began to develope the hinder tube. In the other specimen (fig. 2), on the contrary, the shelly valves are scarcely more developed than they were on the newly-hatched animal, which appears to have proceeded at once, as soon as it came into the world, to form the bag-like cavity over the gape in front and between the ventral edge of the valve, to attach itself to the rock, and to proceed to develope its tube.

It may be observed, though we are not able to assert it positively (as there are only two examples known), that the difference between the two specimens depends on the kind of place to which the animals were attached: the larger one was attached to a mussel-shell, and the other to a piece of rough sandstone rock.

I was glad to see, on consulting Mr. A. Adams's description of this shell, for the purpose of quoting his name and figure, that he had observed this peculiarity, and agrees with me as to the manner in which the tube is formed. He observes: "The fact of the tube being nothing more than the valves greatly expanded and modified, is well shown in one of the specimens." (P. Z. S. 1852, 91.) It does not appear whether Mr. A. Adams considered this formation of the tube as a peculiarity of the species, or as explaining the development of the tube of *Asper-*

gillum in general; most probably the latter, as in his work published since the paper, he still places the species in the subgenus *Foegia* of the same genus.

Some persons, to whom I have stated my idea of the structure of *Humphreyia,* have suggested that the tube of *Aspergillum* might be developed in a similar manner, after the animal had attained its full size in the sand, without any tube; and they explain in this way why the tube of several species of *Warnea* is nearly cylindrical; but the tubes of many species are clavate, small at the siphonal and large at the front end. I cannot agree to this theory, as I do not know of any mollusk that lives sunk in the sand, and then developes a tube; while, on the other hand, *Teredo, Gastrochæna,* and other conchifers which live in tubes, form them as soon as they are hatched, and the tube may be observed increasing in length and diameter as the animal grows,—sometimes even, as in *Furcella,* forming a septum across its base, which is removed when the animal again desires to enlarge its habitation. It is further to be observed, that though the tube of some *Gastrochænæ* and *Teredines* is clavate, yet in other *Teredines* it is nearly cylindrical; and in all these the siphonal end is modified, sometimes elongated, or even reproduced during the life of the mollusk, as in *Aspergillum.* A good account of the manner in which *Gastrochæna* enlarges its more or less exposed, irregular clavate, or retort-like tube, would be an interesting communication, as it is difficult to understand how the small closed chamber of the young shell is altered to the larger chamber of the full-grown individual, unless the animal absorbs and re-deposits the base of the tube after it has increased its size, as the animal of *Furcella* is shown to do, in my paper on the development of that genus in the 'Annals' for April 1858, p. 295; but I have not observed any specimen which justified my coming to that conclusion.

We have been long aware that the valves of *Aspergillum* and *Clavagella* are, when the animals reach the adult size, soldered into the tube in which they live, which caused them to be formerly regarded as univalve, and arranged with the *Serpulæ;* and the exterior appearance of *Humphreyia* would justify such a position in any cabinet.

It appears to me that the anomalous structure of *Mulleria* more nearly resembles that of this shell than any other I know; for, in both, the animal is hatched with two symmetrical valves, which become united together, and are prolonged behind into a tube. But there the similarity ends; for in *Mulleria* the tube is expanded into two laminæ or valves, one of which is attached to a rock, the upper lamina breaks off in an irregular manner from the end of the tube, and the body of the adult mollusk is enclosed between two irregular-shaped valves, like an *Etheria*, with the tube and the valves of the young shell on the produced end of the attached valve. (See Proc. Zool. Soc.)

In *Humphreyia*, on the contrary, the small united valves are attached by their ventral edge, and they are extended behind into a free, ascending, subquadrangular tube, like *Vermetus*, which continues to grow in length as the animal increases in size.

The use of the tubules in *Aspergillum* and *Clavagella*, and of the minute perforations in the lower part of the tube of the genera *Furcella* and *Foegia*, has not been satisfactorily explained. They have been supposed to admit water to the front part of the body of the animal, and have been regarded simply as tubes or perforations, as if they were always open; but they can only be formed round the tentacles, and it is most probable that the tentacles fill up the tubular cavity during the life of the animal, though they are vacant, and the tentacles on which they have been formed are not to be observed in the specimens of the animal which are preserved in spirits. The admission of water to the front of the animal does not appear to be necessary for their œconomy, as such tubules or pores are not to be found in the tubes of *Teredo*, *Gastrochæna*, &c. In some *Clavagellæ* and *Aspergilla*, the tentacles and the tubules which cover them are branched and spread out, as if the mollusk wished to obtain a knowledge of the animals and other bodies in its neighbourhood. They may also serve to steady the tubes, as roots do trees, and prevent their being thrown down by the usual waves of the sea, as it is the kinds which live sunk a small depth in the sand that appear to have the tubules most extended; while those that are sunk deeper, or are fixed on rock, have only perforations in their place,—as trees which have their roots near the surface have them greatly extended horizontally.

It is to be observed, that when these animals have completed their tube, if they extend any more in size, it is only posteriorly in the length of their siphons; and then they extend the length of the shell by the addition of fresh portions to the siphonal end of the tube, as shown by the ruffles in *Warnea* and *Bryopa*.

IV.—*On the Spermatology of a new species of* Nais.

By H. J. Carter, Esq., H.C.S. Bombay.

[With three Plates.]

The following communication contains a description of the development of the spermatozoa in the ovisac with the ovum, in a